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Description

The present invention relates to the manufacture of rods such as are useful for the manufacture of filter elements for smoking articles, and in particular, to filter rods having pelletized materials spaced at predetermined intervals therein.

Popular smoking articles such as cigarettes have a substantially cylindrical rod shaped structure and include a charge of smokable material such as shredded tobacco (eg., cut filler) surrounded by a paper wrapper thereby forming a so-called "tobacco rod." It has become desirable to manufacture cigarettes having cylindrical filter elements aligned in an end-to-end relationship with the tobacco rod. Typically, filter elements are manufactured from fibrous materials such as cellulose acetate tow which is circumscribed by plug wrap. The filter element is attached to the tobacco rod using a circumscribing tipping material. The filter elements generally are provided from so called "filter rods."

Apparatus and methods for providing a cigarette filter rod containing a smoke modifying agent are proposed by US-A-4,549,875; US-A-4,525,385 and US-A-4,476,807. Another type of cigarette filter rod having a continuous flavored thread incorporated therein or wrapped in flavored tape is proposed in US-A-4,281,671. Still other apparatus and methods for manufacturing filter rods having particulate or granular smoke modifying material dispensed therein are proposed in US-A-3,884,741; 3,884,200; 3,957,563 and 4,016,830.

Further, US-A-4,037,524 discloses an apparatus for combining a tube with a cigarette filter wherein said tube represents an individual element and wherein the tubes are cut from a continuous tubing by means of a cutter which is timed with respect to the operation of the machine. More specifically, the cut tubes are initially pushed forward on a wheel by a pushing roll and thereafter slid backwardly by a cover so as to be properly positioned for injection into a tow forming a filter material for said cigarette filter.

It is an object of the present invention to provide an apparatus and method for manufacturing cigarette filter rods having well controlled amounts of a smoke modifying agent therein.

This object is accomplished by means of an apparatus for providing rods for use in the manufacture of smoking articles, each rod having elements individually spaced at predetermined intervals along the length thereof, said apparatus comprising:

a) supply means for providing a continuous supply of rod filler material;

b) an insertion unit including cutting means for continuously cutting individual elements from a continuous strand of plasticized material and further including a rotatable member having a series of pockets positioned at predetermined intervals along the periphery thereof for receiving individual elements cut from said strand and fixedly mounted retaining means extending over the peripheral face of the rotatable member for retaining said elements in said pockets, said retaining means allowing for introduction of the continuous strand (59) to successive pockets along the periphery of the rotatable member preparatory of said cutting operation;

c) positioning means for positioning the individual elements within the supply of filler material; and

d) a rod-making unit for forming a continuous rod having the individual elements positioned at predetermined intervals within said rod,

which apparatus is characterized in

that said cutting means are formed by the combination of said rotatable member and said fixed retaining means which are arranged such that the continuous strand is cut by shearing action between them to form an individual element within each pocket,

that said individual elements are solid masses in the form of individual pellets and

that severing means are provided for subdividing the continuous rod at predetermined intervals.

More particularly, the present invention relates to an apparatus for providing rods such as filter rods for use in the manufacture of smoking articles such as cigarettes. The apparatus includes a means for supplying a continuous supply of rod filler material such as a continuous web of filter material from a source of such material (eg., a bale, bobbin, or the like). The apparatus also includes a means for supplying a continuous strand (eg., a bobbin of thermoplastic strand) which is employed to provide the pelletized material. The apparatus further includes a pellet insertion unit for continuously forming pellets from the strand and inserting or depositing the individual pellets at predetermined intervals within the filler material so supplied (eg., within the web of filter material).

The pellet insertion unit includes a circular rotatable member (eg., a wheel) having a series of grooves or pockets positioned at predetermined intervals along the periphery of the rotatable wheel, and a retaining means (eg., ledger housing) including a strand inlet means for allowing introduction of the strand to successive pockets along the periphery of the wheel. The wheel and retaining means are arranged such that (i) the interaction thereof causes the strand to be subdivided into pelletized form within each individual successive pocket, and (ii) the individual pellets are maintained within the respective pockets until each pellet is deposited

within the filler material so supplied. The apparatus further includes means for controlling the rate of supply of strand, the rate of rotation of the wheel, and the rate of supply of filler material such that the pellets are positioned at predetermined intervals within the stream of filler material (eg., within the web of filter material).

The filler material having each pellet deposited therein is received into a rod-making means for providing a continuous rod. The continuous rod is subdivided into the desired length at predetermined intervals such that the desired number of individual pellets are positioned within the individual subdivided segments (eg., four pellets can be positioned within a rod segment or filter rod thus providing a "four up" rod).

As used herein, the term "pellet" refers to an essentially solid mass which has a spherical, cubic, cylindrical, or other such shape; and in particular to a solid mass of a defined, controlled size and weight. Of particular interest are pellets having an essentially cylindrical shape which are prepared from the controlled cutting of a strand of plasticized material.

The use of the apparatus provides the skilled artisan with an efficient and effective method for manufacturing rods such as filter rods for use in the manufacture of smoking articles such as cigarettes. Particularly preferred rods have filter material contained within a circumscribing outer wrap and the individual pellets are spaced within the rods at predetermined intervals along each rod. In particular, such filter rods can be employed as filter elements for cigarettes wherein each filter element has a pellet positioned therewithin. If desired, two or more pellets can be individually positioned at desired intervals within each filter element.

Of particular interest are pellets which include, carry or contain a smoke modifying agent such as a flavorant. In such a manner, aerosol such as tobacco smoke which travels through the filter element of the smoking article during draw can have flavorant entrained in that aerosol.

Regarding the method the object underlying the present invention is accomplished by means of the method comprising the features of claim 9.

The rods provided according to this invention can have a well controlled, consistent amount of smoke modifying agent positioned at relative ease at predetermined intervals along the length of each rod. For example, the amount or type of smoke modifying agent carried or contained by a particular strand can be varied while the manner or process for making the ultimate rod is held essentially constant. Rods of this invention having the individual pellets of controlled size positioned at predetermined intervals therein are of highly consistent quality as compared to rods having metered amounts of granular materials positioned therein. In addition, the quality of the rods can be well controlled, as electronic inspection of the rods can easily provide for detection of either the presence or absence of a pellet at the desired interval within each rod.

Details of the invention will become apparent from the following description in connection with the enclosed drawings: In the drawings

Figure 1 is a diagrammatic illustration of one embodiment of the rod-making apparatus including a portion of the filter tow processing unit, the source of strand for providing the pelletized material, the pellet insertion unit, and the rod-forming unit;

Figure 2 is an enlarged sectional illustration of a portion of the pellet insertion unit;

Figure 3 is an exploded perspective of the separated elements of a portion of the pellet insertion unit;

Figure 4 is an enlarged perspective of the pellet insertion unit with a portion of the frame thereof shown as partially cut away;

Figure 5 is an enlarged sectional illustration of a portion of the pellet insertion unit;

Figure 6 is an enlarged perspective of a portion of the pellet insertion unit;

Figure 7 is an enlarged perspective of a portion of the pellet insertion unit showing filter tow and the position of placement of a pellet within the filter material;

Figure 8 is a partial sectional view of a portion of the pellet insertion unit showing placement of the pellet from a groove of the rotating wheel into the continuous web of fiber tow;

Figure 9 is a longitudinal sectional illustration of a filter rod including filter material and pelletized material positioned at predetermined and controlled intervals therein; and

Figure 10 is a longitudinal cross sectional illustration of a cigarette having a rod of smokable material, and an axially aligned filter element having a pellet positioned therein.

Referring to Figure 1, an exemplary rod-making apparatus 10 includes a rod-making unit 14 and a pellet insertion unit 18 for placing pelletized material at predetermined intervals within a continuous length of filter material 22. The continuous length of filter material is supplied from a source (not shown) such as a storage bale, bobbin, or the like. Generally, the filter material is processed using a filter material processing unit 26. The continuous length of filter material 22 which has pelletized material incorporated therein at predetermined, spaced intervals is passed through the rod-forming unit 14 thereby forming a continuous rod 30, which can be subdivided by severing means 32 into a plurality of rods 34 which are collected using tray 38 or other

suitable collection means.

The pellet insertion unit 18 includes a rotatable member 50 having the shape of a wheel which is held in place within a ledger housing 57. The pellet insertion unit also includes a tube 56 or other means for feeding or otherwise providing a passageway for continuous strand 59 into the ledger housing. The continuous strand is fed from a bobbin 61, or other means such as a coil.

Referring to Figure 2, strand 59 is pulled into strand drive assembly 65 which includes inlet opening 67, outlet opening 69 into tube 56, and drive assembly including metering roller 71 and pressure roller 73. The metering roller 71 and the pressure roller 73 are rotated in opposite directions as shown by arrows 75 and 77, respectively, such that the strand is pulled and then driven into the tube 56.

Typically, the metering roller 71 has a knurled surface and is manufactured from cold rolled steel, or other suitable material. The pressure roller 73 can be manufactured from resilient rubber or any other suitable material. The relative speed of the two rollers can be preset in order to control the rate at which strand 59 is fed into tube 56. A suitable gear assembly (not shown) for providing rotation of the metering roller (and both the metering roller and pressure roller, if desired) will be apparent to the skilled artisan.

Referring to Figure 3, the pellet insertion unit includes a rotatable wheel 50 having a series of grooves or pockets 52 positioned at predetermined intervals along the periphery 54 thereof. The series of grooves 52 which are positioned along the peripheral face 54 of the wheel are at equally spaced intervals. The number of grooves present in the face of the wheel generally is dependent upon the manner in which the strand is introduced to the pocket, the rate of rotation of the wheel relative to the rate of feed of filter material, and the desired spacing of the individual pellets within the filter rod. For example, a wheel of about 5.3 inch diameter can have 20 grooves, the centers of which are equally spaced at a 21 mm distance. As another example, a wheel of about 5.4 inch diameter can have 14 grooves, the centers of which are equally spaced at 31 mm distance. The width of each groove is less than the width of the face 54 of the wheel, and typically is determined by the diameter of the continuous strand which enters the groove (i.e., the width of the groove is greater than the diameter of the strand). The depth of the groove is dependent upon the desired length of pellet. The wheel 50 is manufactured from pre-tempered, cold-rolled steel, or the like.

The width of wheel 50 is predetermined according to factors such as the circumference of the continuous rod which is manufactured according to this invention and the diameter of the continuous strand which is employed. Generally, the width of the wheel is the width of the peripheral face 54 of the wheel. Of particular interest is a wheel having a width of about 0.25 inch. A wheel with such a width can conveniently be used for the manufacturing of rods having a circumference of about 25 mm. The diameter of the wheel 50 can vary. Typically, the diameter of the wheel is dictated by factors such as the shape, spacing and number of pockets in the peripheral face thereof, and the rate at which the wheel is required to rotate. For most applications involving the manufacture of filter rods for smoking articles, the diameter of the wheel preferably ranges from about 4 inches to about 8 inches.

A series of perforations 79 are positioned about the side face of wheel 50. The perforations each extend as passageways within and through the wheel, and exit through the peripheral face of the wheel as perforations 80 within grooves 52. Thus, individual passageways from the side of the wheel to the bottom face of each groove are provided for assisting in the removal of the pellet from the groove at desired time (as discussed in detail hereinafter).

The ledger housing 57 is positioned as a rim over the peripheral face 54 of the wheel 50 and is spaced from the wheel such that the wheel can rotate freely therein. An opening or passageway 82 through the upper peripheral face of the ledger housing provides a means for the insertion or introduction of strand into the successive pockets along the periphery of the wheel 50 (as discussed in detail hereinafter). A typical passageway 82 has a diameter which approximates the width of the groove, and generally is about 3 mm. The ledger housing extends over the peripheral face of the wheel 50 to near that region where the pellet can be conveniently removed from the groove 52 and positioned within the filter material (as discussed in detail hereinafter). Typically, the face of the wheel 50 is not covered by the ledger housing 57 in the region where the pellet is released from the groove. Preferably, the ledger housing provides a plow or shoe 87 to part or separate the web of filter material to ensure that the pellet is well positioned within the material (as discussed in detail hereinafter). The ledger housing is manufactured from pre-tempered, cold-rolled steel, or the like.

The wheel 50 is positioned within the ledger housing 57, and the two components are supported by housing support 90. The ledger housing is secured to the housing support by bolts 92, or other suitable fastening means. The wheel is secured for rotation within the ledger housing by bolt 94, or other suitable fastening means, which is threaded into the axle-like rotatable support shaft 96 of the housing support 90. In such a manner the wheel

can be rotated about its axis of rotation (shown as dotted line 99 in Figure 3). In particular, the rotatable support shaft 96 extends through opening 101 in the ledger housing to be positioned in contact with the wheel 50 in order that rotation of the shaft will provide rotation of the wheel (i.e., act as a drive shaft for the wheel).

Referring to Figure 4, strand drive assembly 65, wheel 50, ledger housing 57 and housing support 90 are supported by frame 110 (which is shown as partially cut away). The frame 110 provides for secure positioning of the pellet insertion unit relative to the rod-making unit.

Rotation of the drive shaft 96 is provided by a pulley, gear assembly, or other type of drive means (not shown) which is driven by belt 120 (shown in Figure 1) or other such means. Rotation of drive shaft 96 causes rotation of wheel 50 in the direction shown by arrow 121. The belt 120 which is used to provide rotation of drive shaft 96 is driven by pulley 122 or other suitable drive means (shown in Figure 1). Pulley 122 is in turn driven by the rod making unit. A suitable assembly for providing rotation of drive shaft 96 at a rate related to or controlled by the drive mechanism of the rod-making unit will be apparent to the skilled artisan.

Rotation of the drive shaft 96 causes a rotation of pulley 128 or other suitable drive means. As shown in Figure 4, pulley 128 is positioned on drive shaft 96, and the rotation of pulley 128 causes rotation of pulley 130 by way of belt 133. The rotation of pulley 130 provides a means for driving shaft 139. Shaft 139 provides for the rotation of metering roller 71 within strand drive assembly 65 (see Figure 2). In such a manner, the rate of supply of web of filter material, the rate of rotation of the wheel of the pellet insertion unit and the rate of supply of strand can be controlled such that the pellets which are formed are positioned at the desired, predetermined intervals within the web of filter material. In particular, the rate of feed of strand through the drive assembly 65, the formation of the pelletized material within each groove 52, the rate of rotation of the wheel 50, and subsequent positioning of the pellets within the resulting filter rod are synchronized with respect to the rate at which the filter material 22 is fed into the rod-forming unit 14. Other suitable configurations for providing a control of the feed of strand, rotation of wheel and feed of filter material may be apparent to the skilled artisan.

Referring to Figure 5, wheel 50 is rotated in the direction shown by arrow 121. The wheel has a series of perforations 79 through the side face thereof. Each perforation 79 extends into the wheel thereby forming passageways 140 which exit as perforations 80 in the bottom face of the respective grooves 52. The wheel 50 is positioned with the rim-like ledger housing 57 so that the wheel can rotate freely therein. The ledger housing includes passageway 82 which extends through the upper peripheral face thereof in order that strand 59 can be inserted into the groove 52 of the wheel 50. The perforations 79 and 80, and passageways 82 each preferably have circular cross sectional shapes, and diameters of about 1/16 inch. The strand 59 is fed through tube 56 (shown as partially cut away) from the drive assembly at a predetermined rate (as discussed previously).

The wheel and ledger housing are arranged such that the interaction thereof causes the strand to be subdivided into pelletized form thereby forming pellet 145 within each individual successive pocket. In particular, the rate of feed of strand, the rate of rotation of the wheel, the depth of the groove and the length of the groove are such that the strand can be fed into the groove and sheared to form pellet 145 of the desired size. Preferably, each groove is generally wedge-shaped along the length thereof, wherein the depth of the groove extends from shallow to its maximum depth. In addition, the positioning of the grooves and the rotation of the wheel are such that the strand first enters the groove through passageway 82 in the ledger housing into the shallow portion of the groove, and then the strand is sheared to form pellet 145 when the foremost end of the strand approaches reaching the deep portion of the groove. Representative grooves have lengths (as measured from the deepest portion of a groove to the deepest portion of an adjacent groove) of about 20 mm to about 35 mm; and maximum depths of about 2.5 mm.

Each generally wedge-shaped groove preferably has an abrupt surface extending from the deepest portion of the groove towards the periphery of the wheel. In such a manner, the rotating wheel and ledger housing can interact such that the strand which extends into the groove can be sheared into the desired size thereby forming pellet 145. Such a cutting action is provided as a result of close spacing of the inner face of the ledger housing relative to the outer face of the wheel, and the relatively small diameter of the passageway 82. In particular, the strand is forced against the back face of the groove, and the resulting close spacing of the groove and the ledger housing acts to cut the strand into the form of a pellet. After a pellet is formed, the strand is fed into the successive groove. In such a manner, continuous formation of pellets is effected.

The individual pellets 145 remain well positioned in each respective groove until the insertion of the pellet into the web of filter material is desired. In particular, the rim-like nature of the ledger housing 57 and plow 87 relative each groove 52,

and the relative close spacing of the inner surface of the ledger housing and plow relative to the outer face of the groove allows each individual pellet to be maintained within the respective groove, preferably without moving longitudinally within the groove, until each pellet is deposited within the web of filter material.

Referring to Figure 6, the continuous web of filter material 22 is fed into guide or block 151 (shown as partially cut away). The guide 151 receives the wide band of filter material, and gradually forms the web into a composite which generally resembles a cylindrical composite. The plow 87 of the ledger housing separates or spreads the filter material such that the pellet 145 is positioned or placed at the desired location within the web of filter material. When the tow reaches the endmost portion of the plow, the motion of the tow acts to close itself into a cylindrical composite which contains the individual pellets at the desired locations therein. A suitable plow has a maximum depth of about 0.25 inch.

The pellet is maintained within a groove until the location at which the ledger housing does not cover the wheel as a rim, at which point the pellet is inserted into the web of filter material. Typically, the pellet falls (i.e., is rejected) from the groove and into the web by the action of gravity.

Rejection of each pellet at the desired location can be assured by air jet 155 or other suitable means which can act as a nozzle. In particular, the nozzle 155 is positioned so as to force air into perforation 79 along the side face of wheel 50 which in turn exits the previously described perforation in the bottom of the groove. In such a manner, the action of gravity is assisted and the pellet is forced from the selected groove into the web of filter material at the desired location. The nozzle 155 is held in place so as to be in registry with the desired perforation 79 in the side face of wheel 50 by frame 158 (shown as partially cut away). The air is received from a source (not shown) such as a laboratory air supply through tube 161, or other suitable means. Other techniques for assuring removal of each pellet from each groove at the desired location (eg., the use of mechanical or pneumatic plungers) may be apparent to the skilled artisan.

Referring to Figure 7, the guide or block 151 (the top portion of which is shown as partially cut away) has a relatively wide opening 165 at one end in order that the filter material 22 can be fed therein. A suitable wide opening is about 0.5 inch high and about 2.5 inches in width. A suitable block has a length of about 5.5 inches. The shape of the hollow inner portion of the block is such that the filter material is formed into a composite which more generally resembles a cylinder. A suitable composite is about 9/16 inch in diameter. In particular, the inner portion of the block 151 is a hollow region or cavity in order that the filter material can be passed therethrough. The block has a longitudinally extending slot 168 along the top portion thereof in order to allow the rotating wheel and ledger housing (not shown) to extend into the web of filter material and to insert pellet 145 at the desired location therein. A suitable slot is about 4 inches long for a block having a length of about 5.5 inches. In a suitable situation, the plow extends into the slot so as to extend about 1/8 inch from the extreme bottom portion of the hollow inner portion of the block. The cylindrical composite 170 is received by the receiving means of the rod-making unit (as discussed hereinafter).

Referring to Figure 8, the plow 87 and wheel 50 extend into the block 151 (shown as a cut away sectional view) and into the web of filter material 22. The pellet 145 is ejected from groove 52 (a portion of wheel 50 is cut away) and into the web near the point at which the plow no longer acts as a rim over the peripheral face of the wheel. In such a manner, a series of pellets 145, 171, 172 and 173 are positioned in the web at predetermined intervals within the cylindrical composite 170 which exits block 151 into a gathering means such as a tongue (not shown).

Referring again to Figure 1, filter material 22 is supplied and is passed into the rod forming unit 14. For example, filamentary tow such as cellulose acetate is processed using a conventional filter tow processing unit such as a commercially available E-60 supplied by Arjay Equipment Corp., Winston-Salem, NC. A portion of such an apparatus is designated by reference numeral 26 in Figure 1. Normally a plasticizer such as triacetin is applied to the filamentary tow using known techniques.

The continuous length of filter material 22 is pulled through the block 151 by the action of the rod forming unit 14 and the individual pellets are inserted at predetermined intervals within the web of filter material. The filter material is further directed into a gathering means 180 of the rod forming unit 14. The gathering means can have a tongue and horn configuration, a gathering funnel configuration, stuffer or transport jet configuration, or the like. The tongue 180 provides for further gathering, compaction, conversion or formation of the cylindrical composite from block 151 into an essentially cylindrical (i.e., rod-like) shape whereby the continuously extending strands or filaments of the filter material extend essentially along the longitudinal axis of the cylinder so formed.

The filter material which has been compressed into a cylindrical composite is received into the rod-forming unit 14. The cylindrical composite is fed into wrapping mechanism 182 which includes

endless garniture conveyer belt 184 or other garniture means. The garniture conveyer belt 184 is continuously and longitudinally advanced using advancing mechanism 186 such as a ribbon wheel or cooperating drum so as to transport the cylindrical composite through wrapping mechanism 182. The wrapping mechanism provides a strip of wrapping material 188 to the outer surface of the cylindrical composite in order to produce continuous wrapped rod 30.

The strip of wrapping material 188 is provided from rotatable bobbin 190. The wrapping material is drawn from the bobbin, is trained over a series of guide rollers, passes under block 151, and enters the wrapping mechanism 182 of the rod-forming unit. The endless garniture conveyer belt 184 transports both the strip of wrapping material and the cylindrical composite in a longitudinally extending manner through the wrapping mechanism 182 while draping or enveloping the wrapping material about the cylindrical composite. The seam formed by an overlapping marginal portion of wrapping material has adhesive (eg., hot melt adhesive) applied thereto at applicator region 195 in order that the wrapping material can form a tubular container for the filter material. The adhesive can be cooled using chill bar 198 in order to cause rapid setting of the adhesive. It is understood that various other sealing means and other types of adhesives can be employed in providing the continuous wrapped rod.

The continuous wrapped rod 30 passes from the sealing means and is subdivided (eg., severed) at regular intervals at the desired, predetermined length using cutting assembly 32 which includes as a rotary cutter, a highly sharpened knife, or the like. It is particularly desirable that the cutting means not flatten or otherwise adversely affect the shape of the rod. The rate at which the cutting assembly severs the continuous rod at the desired points is controlled relative to the rate at which the pellets are inserted into the continuous web of filter material. In particular, the cutting assembly is geared in a direct drive relationship to the drive assembly of the rod-making apparatus. A suitable manner for providing the required timing for severing the continuous rod at the desired length and with the desired number of pellets positioned at the predetermined intervals therein will be apparent to the skilled artisan.

The succession or plurality of rods 34 are collected for use in collection means 38 which is a tray, a rotary collection drum, or the like. If desired, the rods can be transported directly to a cigarette making machine. In such a manner, in excess of 1,400 rods, each of about 100 mm length, can be manufactured per minute.

The filter material can vary and is any material which can be employed in providing a tobacco smoke filter for cigarettes. Especially preferred is filamentary tow such as cellulose acetate, polypropylene, or the like. For example, cellulose acetate tow having 3 denier per filament and 35,000 total denier can provide a suitable filter rod. As another example, cellulose acetate tow having 8 denier per filament and 40,000 total denier can provide a suitable filter rod.

The continuous strand is most preferably a plasticized material. Most preferably the continuous strand is provided from a thermoplastic material such as polyethylene, polypropylene, nylon, or the like. Typically, the strand consists principally of or consists essentially of high density polyethylene material having a generally circular cross section of about 2.5 mm diameter. Examples of suitable strands are those strands which contain flavors and are available from Applied Fragrance Technologies, Inc., Mount Olive, NJ. For example, a suitable strand having a circular cross section of 2.5 mm diameter, and containing high density polyethylene and menthol flavorant is obtained from Applied Fragrance Technologies, Inc., as Experimental Strand 4-53A.

The strand most desirably has a consistency such that the pellet insertion apparatus of this invention can efficiently and effectively form pelletized material from the strand. For this reason, a material having a plasticized character is desirable. In particular, the strand should not be so resilient that handling is difficult, or the interaction of ledger housing and wheel cannot cut the strand to a pellitized form. Furthermore, the preferred strand should not be so brittle that undesirable chipping or shattering of the strand and/or pellet occurs during the pellet formation steps. However, the strand should have a fairly hard character in order to allow for efficient cutting or shearing of the strand to form the pellets. For example, it is highly desirable that the strand not be so soft such that the strand does not cut cleanly. In particular, overly soft strands may provide pellets having undesirable thin fibrous strands or "hairs" formed during the shearing operations.

The size and shape of the pellet can vary. Generally, the pellet has a generally cylindrical shape. Preferably, the pelletized material is of a size such that each individual pellet can be positioned within the filter element of a cigarette without providing negative properties to the smoking article. For example, it is desirable that the pellet not (i) stick out of the mouthend of the filter element or be otherwise visible; (ii) be so large that the draw resistance of the smoking article be undesirably affected; or (iii) provide an undesirable weight or feel to the smoking article. A suitable pellet for use in a filter element having a length of about 27 mm and a circumference of about 24.5

mm has a substantially cylindrical shape with a length of about 2.5 mm and diameter of about 2.5 mm.

Most preferable strands (and hence the resulting pelletized material) act as substrates for carrying or containing smoke modifying agents such as flavorants, salivators, or the like. The amount of smoke modifying agent carried or contained by an individual pellet depends upon the properties and characteristics of the smoke modifying agent, the characteristics of the polymer system substrate, the surface area of the pellet, the desired delivery of smoke modifying agent, and other such factors.

Referring to Figure 9, filter rod 34 generally can be further subdivided into cylindrical shaped filter elements using techniques as are known by the skilled artisan familiar with conventional cigarette manufacturing. The filter rod 34 includes filter material 22 encased in circumscribing wrapping material 188 such as conventional air permeable or air impermeable paper plug wrap, or other suitable wrapping material. As an example, four pellets 208, 209, 210 and 211 are individually spaced at predetermined intervals within the rod 34. In particular, each of the pellets are positioned along the rod in a spaced apart relationship from one another. As shown by lines 1-1, 2-2 and 3-3, respectively, the rod can be used as a "four up" rod to provide four filter elements. Other configurations such as the so called "six up" rods also can be manufactured. Rod sizes for use in the manufacture of filter elements for cigarettes can vary, but typically range in length from about 80 mm to about 140 mm, and from about 16 mm to about 27 mm in circumference. For example, a typical rod having a 100 mm length and a 24.53 mm circumference exhibits a pressure drop of from about 200 mm to about 400 mm of water as determined at an airflow rate of 17.5 cc/sec. using an encapsulated pressure drop tester, sold commercially as Model No. FTS-300 by Filtrona Corporation.

Referring to Figure 10, smoking article 220 has the form of a cigarette. The article 220 includes rod 222 including smokable material such as tobacco cut filler 224, or the like, contained in circumscribing wrapping material 225 such a conventional cigarette paper wrap. The ends of the rod are open to expose the smokable material. Generally, the length of the rod 222 ranges from about 55 mm to about 85 mm. The smoking article further includes filter element 226 positioned adjacent one end of rod 222 such that the filter element is aligned with the rod in an end-to-end relationship. Filter element 226 has a cross sectional shape similar to that of rod 222. The filter element 226 is provided from filter rod, the previously described filter rod and includes filter material 22, circumscribing plug wrap 188 and an individual pellet 208. The pellet 208 is a solid mass positioned within the filter element such that the pellet cannot be observed by visual inspection of the extreme mouthend of the cigarette. For example, the pellet is centrally located longitudinally within the filter rod. The filter element 226 is attached to the rod 222 by tipping material 228 which circumscribes both the filter element and an adjacent region of the rod. The inner surface of the tipping material 228 is fixedly secured (eg., using an adhesive) to the outer surface of the filter element 226 and to the wrapping material 225 of an adjacent region of the rod 222. The tipping material 228 circumscribes the rod 222 over a longitudinal length which can vary but is typically that length sufficient to provide good attachment of the filter element to the rod. The tipping material can be a conventional air permeable or air impermeable tipping paper. The cigarette can be equipped with air dilution perforations or other means for providing air dilution thereto, if desired. It is understood that more than one individually placed pellet can be positioned within the filter element, if desired.

Smoke modifying agents which are carried or contained by the pellets include flavorants such as menthol, cinnamon, citrus, cocoa, licorice, tobacco extract, nicotine, and the like. For example, a typical filter element can contain one pellet containing from about 1 to about 10 percent of menthol, based on the total weight of the pellet. The use of flavor-containing pellets in filter elements of smoking articles provides for a well controlled application of desirable ingredients such as flavors into the smoking article. Of particular interest is the fact that certain materials can provide a continuous, controlled release of certain ingredients over time. In addition, the level of flavorant delivered to the user can be well controlled, as when the flavorant is entrained in the mainstream aerosol during draw. As the flavorants are delivered to an appreciable degree from the filter element of the smoking article, a relatively large amount of flavorant is not subjected to the high temperatures experienced in other regions of the smoking article (eg., in the tobacco rod). In addition, the filter element is capable of modifying (eg., flavoring) the aerosol delivered by a smoking article without the necessity of noticeably affecting the apparatus or structure of the smoking article.

Claims

1. An apparatus (10) for providing rods (30) for use in the manufacture of smoking articles, each rod (30) having elements (145) individually spaced at predetermined intervals along the length thereof, said apparatus comprising:

a) supply means (26) for providing a continuous supply of rod filler material (22);
b) an insertion unit (18) including cutting means (50, 57) for continuously cutting individual elements (145) from a continuous strand (59) of plasticized material and further including a rotatable member (50) having a series of pockets (52) positioned at predetermined intervals along the periphery thereof for receiving individual elements (145) cut from said strand (59) and fixedly mounted retaining means (57) extending over the peripheral face of the rotatable member (50) for retaining said elements (145) in said pockets (52), said retaining means (57) allowing for introduction of the continuous strand (59) to successive pockets (52) along the periphery of the rotatable member (50) preparatory of said cutting operation;
c) positioning means (87, 151) for positioning the individual elements (145) within the supply of filler material (22); and
d) a rod-making unit (14) for forming a continuous rod (30) having the individual elements (145) positioned at predetermined intervals within said rod (30),

said apparatus being characterized in

that said cutting means are formed by the combination of said rotatable member (50) and said fixed retaining means (57) which are arranged such that the continuous strand (59) is cut by shearing action between them to form an individual element (145) within each pocket (52),

that said individual elements (145) are solid masses in the form of individual pellets (145) and

that severing means (32) are provided for subdividing the continuous rod (30) at predetermined intervals.

2. The apparatus according to claim 1, wherein said supply means (26) is a means for supplying a continuous web of filter material (22).

3. The apparatus according to claim 2, wherein said supply means (26) is a tow processing unit.

4. The apparatus according to claim 2 or 3, characterized by a wrapping mechanism (182) for providing a circumscribing outer wrap for the continuous rod (30).

5. The apparatus according to one of claims 1 to 4, wherein the individual pellets (145) are maintained within the respective pockets (52) until each pellet (145) is deposited within the web of filter material (22).

6. The apparatus according to one of claims 2 to 5, being characterized by means for controlling the rate of supply of such continuous strand (59), the rate of rotation of said circular rotatable member (50) and the rate of supply of said filter material (22), such that the pellets (145) are positioned at predetermined intervals within the web of filter material (22).

7. The apparatus according to one of claims 1 to 6, being characterized in that said severing means (32) are provided for forming filter rods such said the desired number of individual pellets (145) are positioned at the desired positions within the filter rods.

8. The apparatus according to one of claims 1 to 7, characterized in that said retaining means (57) has the form of a plow in the region where each individual pellet (145) is deposited within the web of filter material (22).

9. A process for manufacturing rods for use in the manufacture of smoking articles, each rod having individual elements spaced at predetermined intervals along the length of said rods, the process comprising:
a) continuously supplying rod filler material;
b) continuously cutting said individual elements from a continuous strand of plasticised material by a shearing action between a rotatable member comprising a series of pockets which are positioned along the peripheral face of said element at equally spaced intervals and a fixed retaining means, so as to obtain said individual elements as solid masses in the form of individual pellets in said pockets;
c) continuously inserting said individual pellets from each respective pocket at predetermined intervals within the filler material;
d) forming a continuous rod having said pellets positioned at predetermined intervals within the rod; and
e) subdividing the continuous rod at predetermined intervals.

Patentansprüche

1. Vorrichtung (10) zum Bereitstellen von Stangen (Stäben) (30) zur Verwendung bei der Herstellung von Raucherartikeln, wobei jede Stange (30) Elemente (145) aufweist, die einzeln im Abstand voneinander in vorgegebenen Abstän-

den (Intervallen) längs der Länge der Stange angeordnet sind, und wobei die Vorrichtung umfaßt:

a) eine Versorgungseinrichtung (26) zum Liefern eines kontinuierlichen Nachschubs von Stangenfüllermaterial (22);

b) eine Einsetzeinheit (18), welche Schneideinrichtungen (50, 57) zum kontinuierlichen Abschneiden einzelner Elemente (145) von einem kontinuierlichen Strang (59) eines plastifizierten Materials umfaßt und welche ferner ein drehbares Element (50) umfaßt, welches eine Serie von Taschen (52) aufweist, die in vorgegebenen Abständen (Intervallen) längs des Umfangs derselben vorgesehen sind, um die einzelnen Elemente (145) aufzunehmen, welche von dem Strang (59) abgeschnitten wurden, sowie fest montierte Rückhalteeinrichtungen (57), die sich über die Umfangsfläche des drehbaren Elementes (50) erstrecken, um die einzelnen Elemente (145) in den Taschen (52) zurückzuhalten, wobei die Rückhalteeinrichtungen (51) das Einführen des kontinuierlichen Stranges (59) in aufeinanderfolgende Taschen (52) längs des Umfangs des drehbaren Elementes (50) in Vorbereitung des Schneidvorganges gestatten;

c) Positioniereinrichtungen (87, 151) zum Positionieren der einzelnen Elemente (145) in dem Nachschub des Füllermaterials (22); und

d) eine Stangenherstelleinheit (14) zum Formen einer kontinuierlichen Stange (30), bei der die einzelnen Elemente (145) in der Stange (30) in vorgegebenen Abständen positioniert sind;

wobei die Vorrichtung **dadurch gekennzeichnet** ist,

daß die Schneideinrichtungen durch die Kombination des drehbaren Elementes (50) und der feststehenden Rückhalteeinrichtungen (57) gebildet werden, die derart angeordnet sind, daß der kontinuierliche Strang (59) durch eine Scherwirkung zwischen diesen Elementen abgeschnitten wird, um in jeder Tasche (52) ein einzelnes Element (145) zu bilden,

daß die einzelnen Elemente (145) feste Massen in der Form von einzelnen Pellets (145) sind, und

daß Abtrenneinrichtungen (32) vorgesehen sind, um die kontinuierlichen Stangen (30) in vorgegebenen Abständen zu unterteilen.

2. Vorrichtung nach Anspruch 1, bei der die Versorgungseinrichtung (26) eine Einrichtung zum Zuführen eines kontinuierlichen Bandes eines Filtermaterials (22) ist.

3. Vorrichtung nach Anspruch 2, bei der die Versorgungseinrichtung (26) eine Strangverarbeitungseinheit ist.

4. Vorrichtung nach Anspruch 2 oder 3, gekennzeichnet durch einen Umhüllmechanismus (182) zum Erzeugen einer umhüllenden äußeren Hülle für die kontinuierliche Stange (30).

5. Vorrichtung nach einem der Ansprüche 1 - 4, bei der die einzelnen Pellets (145) in den betreffenden Taschen (52) gehalten werden, bis jedes einzelne Pellet (145) in dem Band des Filtermaterials (22) deponiert wird.

6. Vorrichtung nach einem der Ansprüche 2 - 5, gekennzeichnet durch Einrichtungen zum Steuern der Geschwindigkeit der Zuführung des kontinuierlichen Stranges (59), der Geschwindigkeit der Drehung des kreisrunden drehbaren Elementes (50) und der Geschwindigkeit der Zuführung des Filtermaterials (22), derart, daß die Pellets (145) in vorgegebenen Abständen in dem Band aus Filtermaterial (22) positioniert werden.

7. Vorrichtung nach einem der Ansprüche 1 - 6, dadurch gekennzeichnet, daß die Abtrenneinrichtungen (32) vorgesehen sind, um Filterstangen in der Weise zu formen, daß in den Filterstangen die gewünschte Anzahl von einzelnen Pellets (145) in den gewünschten Positionen positioniert sind.

8. Vorrichtung nach einem der Ansprüche 1 - 7, dadurch gekennzeichnet, daß die Rückhalteeinrichtungen (57) in dem Bereich, in dem die einzelnen Pellets (145) in dem Band des Filtermaterials (22) deponiert werden, die Form eines Pfluges haben.

9. Verfahren zum Herstellen von Stangen zur Verwendung bei der Herstellung von Raucherartikeln, wobei jede Stange einzelne Elemente aufweist, die in vorgegebenen Abständen (Intervallen) voneinander längs der Länge der Stangen angeordnet sind und wobei das Verfahren umfaßt:

(a) das kontinuierliche Zuführen eines Stangenfüllermaterials;

(b) das kontinuierliche Abschneiden der einzelnen Elemente von einem kontinuierlichen Strang aus plastifiziertem Material durch eine Scherwirkung zwischen einem drehbaren Element, welches eine Serie von Taschen umfaßt, die längs einer Umfangsfläche des Elementes in gleichmäßigen Abständen angeordnet sind, und feststehen-

den Rückhalteeinrichtungen, derart, daß die einzelnen Elemente als feste Massen in der Form von einzelnen Pellets in den Taschen erhalten werden;

(c) das kontinuierliche Einsetzen der einzelnen Pellets aus jeder der betreffenden Taschen mit vorgegebenen Abständen in das Füllermaterial;

(d) das Formen einer kontinuierlichen Stange, bei der die Pellets in vorgegebenen Abständen in der Stange positioniert sind; und

(e) das Unterteilen der kontinuierlichen Stange in vorgegebenen Abständen.

Revendications

1. Appareil (10) destiné à former des boudins (30) destinés à être utilisés pour la fabrication d'articles à fumer, chaque boudin (30) ayant des éléments (145) séparés individuellement par des intervalles prédéterminés sur leur longueur, l'appareil comprenant :

a) un dispositif d'alimentation (26) destiné à transmettre un courant continu de matière (22) de filtre de boudin,

b) un ensemble (18) d'insertion comprenant un dispositif de coupe (50, 57) destiné à couper de façon continue des éléments individuels (145) dans un brin continu (59) d'une matière plastifiée et comprenant en outre un organe rotatif (50) ayant une série de logements (52) séparés par des intervalles prédéterminés à sa périphérie afin qu'ils logent les éléments individuels (145) coupés dans le brin (59) et un dispositif (57) de retenue, monté à demeure et disposé audessus de la face périphérique de l'organe rotatif (50) afin qu'il retienne lesdits éléments (145) dans les logements (52), le dispositif de retenue (57) permettant l'introduction du brin continu (59) dans les logements successifs (52) à la périphérie de l'organe rotatif (50) avant l'opération de coupe,

c) un dispositif (87, 151) de positionnement des éléments individuels (145) dans le courant de matière (22) de filtre, et

d) un ensemble (14) de fabrication de boudin destiné à former un boudin continu (30) dans lequel les éléments individuels (145) sont placés à intervalles prédéterminés dans le boudin (30),

l'appareil étant caractérisé en ce que

le dispositif de coupe est formé par combinaison de l'organe rotatif (50) et du dispositif fixe de retenue (57) qui sont disposés de manière que le brin continu (59) soit coupé par l'action de cisaillement entre eux pour la formation d'un élément individuel (145) dans chaque logement (52),

les éléments individuels (145) sont des masses solides sous forme de pastilles individuelles (145), et

le dispositif (32) de séparation est destiné à séparer le boudin continu (30) à intervalles prédéterminés.

2. Appareil selon la revendication 1, dans lequel le dispositif d'alimentation (26) est un dispositif destiné à transmettre une feuille continue d'une matière de filtre (22).

3. Appareil selon la revendication 2, dans lequel le dispositif d'alimentation (26) est un ensemble de traitement d'une mèche.

4. Appareil selon la revendication 2 ou 3, caractérisé par un mécanisme d'enveloppement (182) destiné à placer une enveloppe externe périphérique destinée au boudin continu (30).

5. Appareil selon l'une des revendications 1 à 4, dans lequel les pastilles individuelles (145) sont maintenues dans les logements respectifs (52) jusqu'à ce que chaque pastille (145) soit déposée dans la feuille d'une matière (22) de filtre.

6. Appareil selon l'une des revendications 2 à 5, caractérisé par un dispositif de réglage de la vitesse d'avance du brin continu (59), de la vitesse de rotation de l'organe rotatif circulaire (50) et de la vitesse d'avance de la matière de filtre (22), afin que les pastilles (145) soient placées à intervalles prédéterminés dans la feuille de matière de filtre (22).

7. Appareil selon l'une des revendications 1 à 6, caractérisé en ce que le dispositif de séparation (32) est destiné à former des boudins de filtre de manière que le nombre voulu de pastilles individuelles (145) occupe les positions voulues dans les boudins de filtre.

8. Appareil selon l'une des revendications 1 à 7, caractérisé en ce que le dispositif de retenue (57) a la forme d'un soc dans la région dans laquelle chaque pastille individuelle (145) est déposée dans la feuille de matière de filtre (22).

9. Procédé de fabrication de boudins destinés à être utilisés dans la fabrication d'articles à fumer, chaque boudin ayant des éléments individuels espacés à des intervalles prédéterminés,

le long des boudins, le procédé comprenant :

a) la transmission continue d'une matière de filtre de boudins,

b) la découpe continue des éléments individuels dans un brin continu d'une matière plastifiée par une action de cisaillement entre l'organe rotatif comprenant une série de logements qui sont positionnés le long de la face périphérique de l'élément à intervalles réguliers, et un dispositif fixe de retenue, afin que les éléments individuels soient obtenus sous forme de masse solide constituée par des pastilles individuelles placées dans les logements,

c) l'introduction continue des pastilles individuelles de chaque logement respectif à intervalles prédéterminés dans la matière de filtre,

d) la formation d'un boudin continu dans lequel les pastilles sont positionnées à des intervalles prédéterminés dans le boudin, et

e) la subdivision du boudin continu à intervalles prédéterminés.

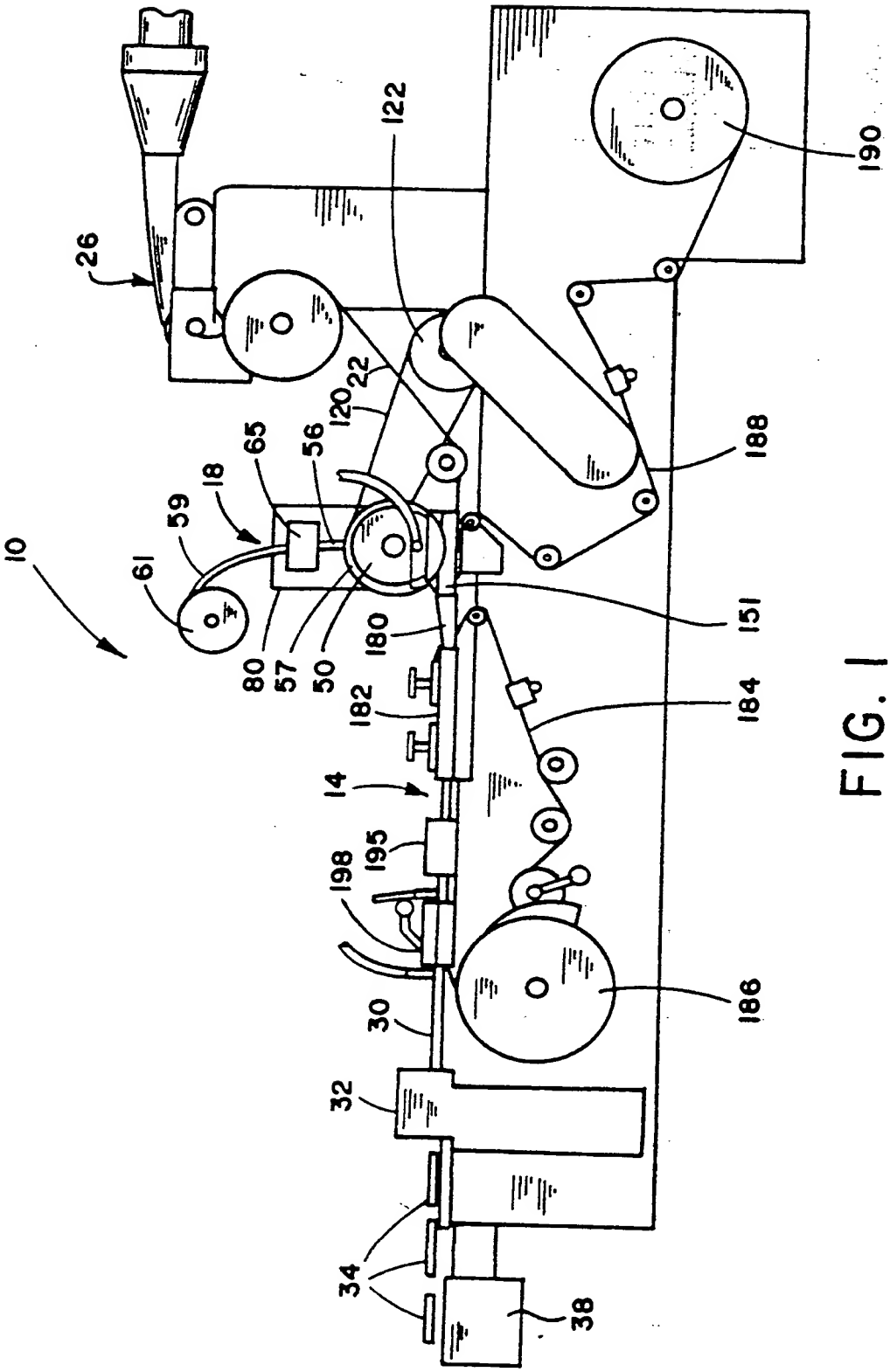
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FIG. 1

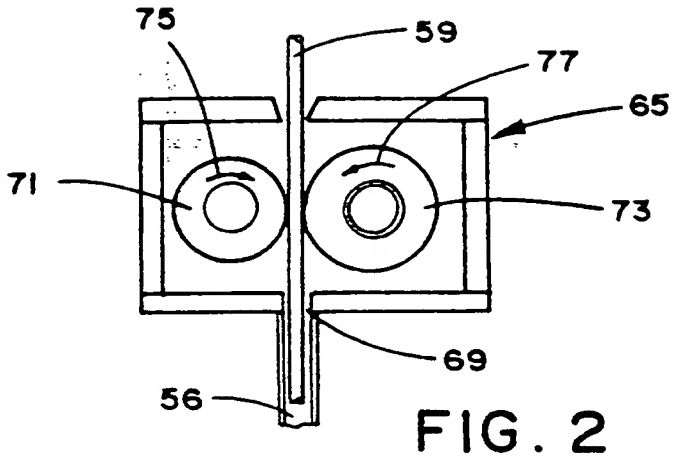

FIG. 2

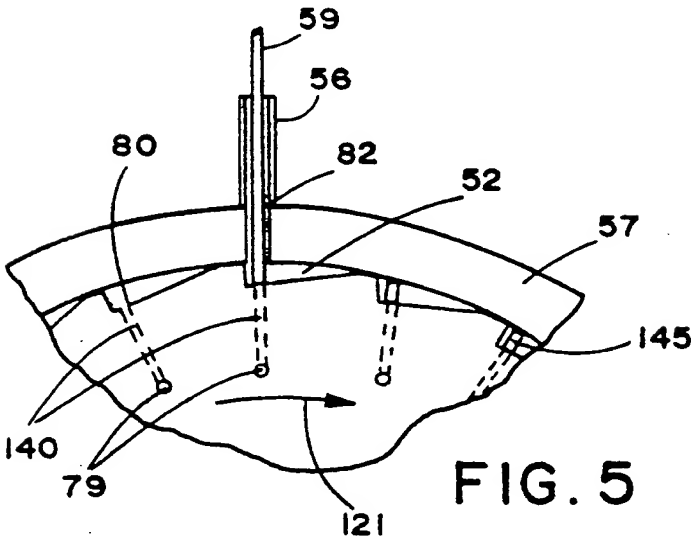

FIG. 5

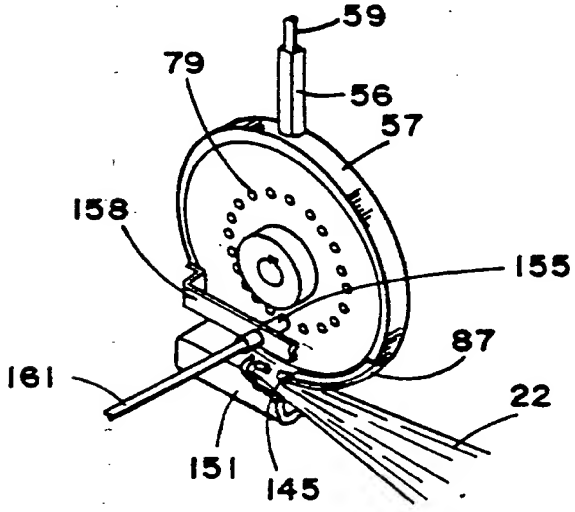

FIG. 6

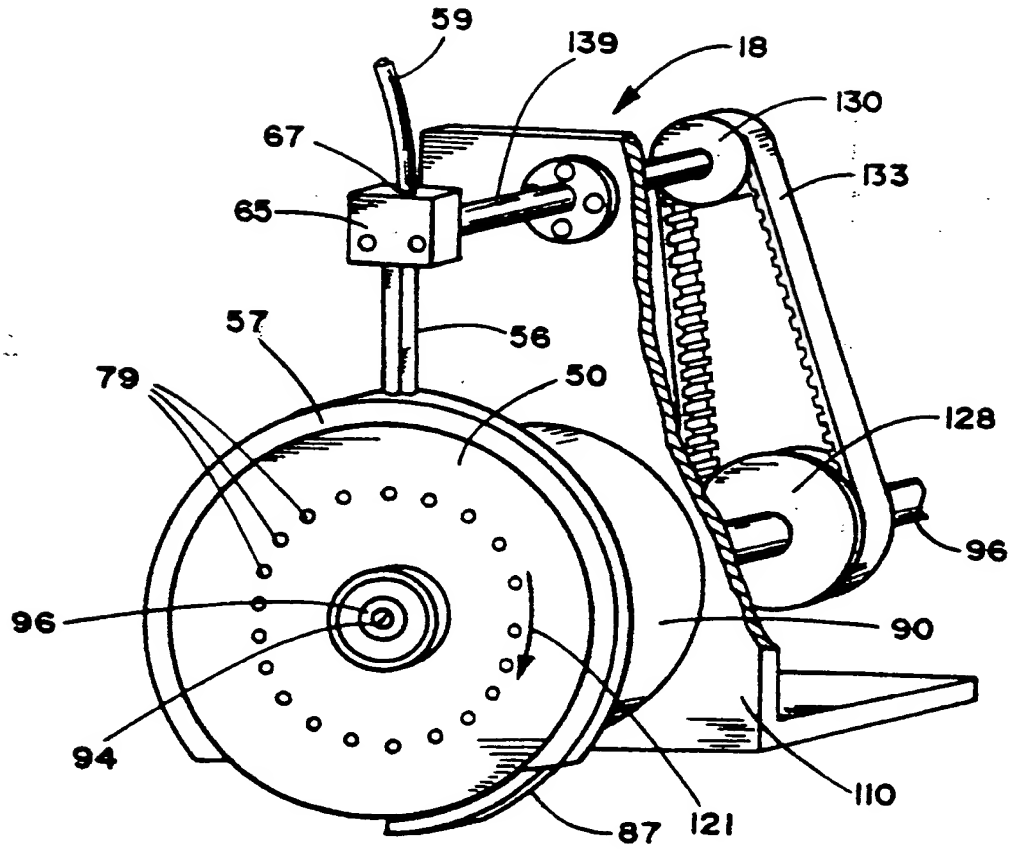
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FIG. 4

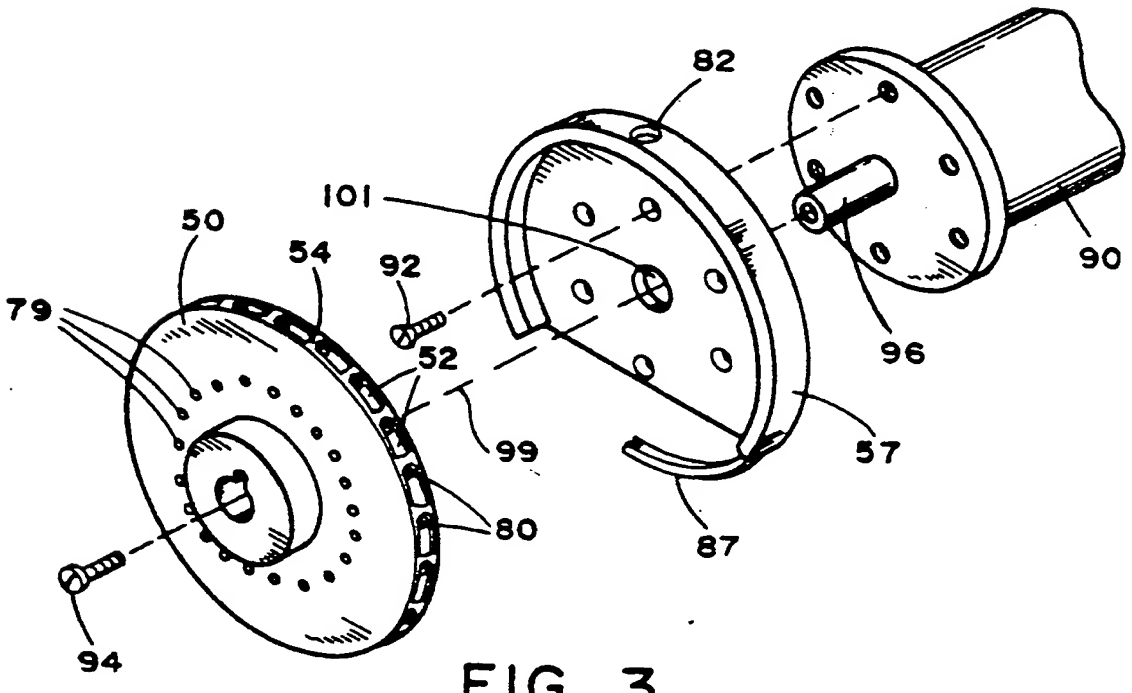
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FIG. 3

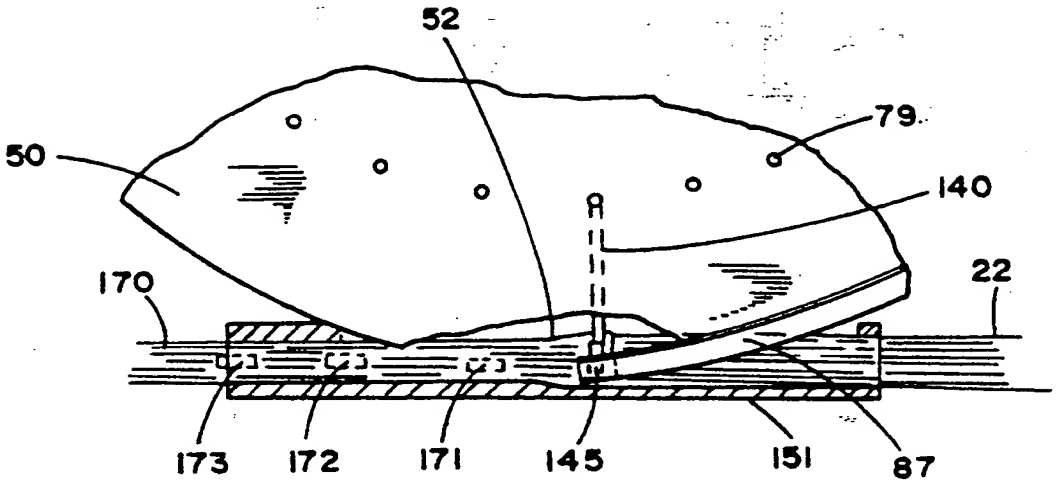

FIG. 8

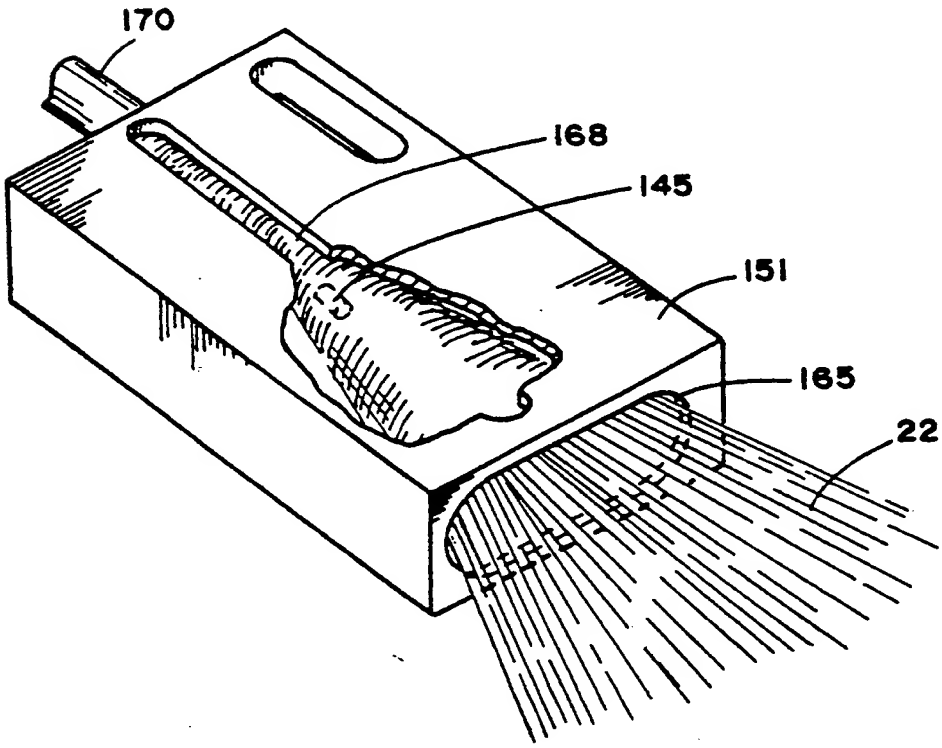

FIG. 7

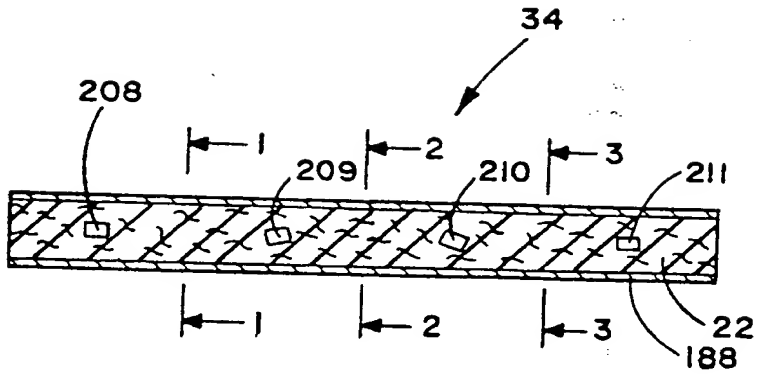
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FIG. 9

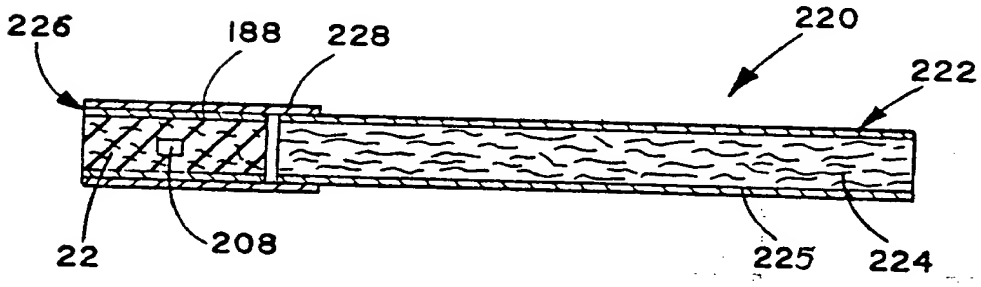
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FIG. 10